DOCUMENT RESUME

ED 172 402 EA 011 834

AUTHOR	Hess, Fritz
TITLE	Class Size Revisited: Glass and Smith in Perspective.
INSTITUTION	East Syracuse - Minoa Central Schools, East Syracuse, N.Y.
PUB DATE	Feb 79
NOTE	11p.; For a related document, see ED 168 129
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Academic Achievement; *Class Size; Elementary Secondary Education; *Research Methodology; *Statistical Analysis

ABSTRACT

Gene V. Glass and Mary Lee Smith claim in their report, "Meta-Analysis of Research on the Relationship of Class-Size and Achievement" (ED 168 129), that their integration of data from 80 previous studies through complex regression analysis techniques revealed a "clear and strong relationship" between decreases in class size and increases in academic achievement. Due to numerous errors in methodology, these findings are highly suspect. These errors include the incorrect assumption that the size of their sample assured randomization, the compounding of statistical errors already existing in the original studies, a lack of adequate concern for statistical significance, and a failure to investigate or account for all the important variables involved in the problem. An additional difficulty is that Glass and Smith failed to take into account the realistic constraints of educational finance, thereby reducing the possible value of their findings. (Author/PGD)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED172402

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

CLASS SIZE REVISITED: GLASS AND SMITH IN PERSPECTIVE

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Fritz Hess

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Fritz Hess, Superintendent of Schools
East Syracuse-Minoa Central Schools
East Syracuse, New York 13057

February 1979

EA 011 834

The issue of class size is alive once more! The connection, or lack of connection, between the size of instructional groups and the academic achievement of students continues to be a major topic of discussion in American schools. The chief new development is the completion of a study by Gene V. Glass and Mary Lee Smith, an investigation which claims to demonstrate the existence of 'a clear and strong relationship' between class size and achievement. Such factors as declining enrollments and challenges to existing systems of school finance, also increase the relevance of the class size issue.

Before embarking on a massive reconsideration of the whole subject of class size, however, it might be necessary to analyze and digest the work of Glass and Smith. Through integration of their effort with existing knowledge, a clearer perspective on the present state-of-the-art in this field might be obtained.

The research of Glass and Smith represents an attempt to integrate almost 80 studies dealing with the relationship between class size and student achievement. No new experiments were performed. The study was innovative in its methods of synthesizing available data. The authors report that through "....complex methods of regression analysis, the comparisons were integrated into a single curve.." showing the relationship between the two variables.[1] This curve, Glass and Smith have emphasized, demonstrates the existence of an inverse relationship between class size and achievement. Most of the benefits from reduced size are obtained when the groups number fewer than 20 pupils.

The work of Glass and Smith is an interesting and well-intentioned effort. However, appreciation of the wider significance of this study

requires evaluation of its methodology, scope, and implications.

The construction of a method for integrating a large number of independently conceived and conducted surveys into a single body of conclusions represents an immense challenge. Glass and Smith were not deterred by wide variations in the complexity and quality of available data. Because of the complicated structure of their information, they ignored ordinary matters of statistical inference.[2] Assuming the size of their sample to be large enough to assure a random distribution, and rejecting the existence or lack of statistical significance in component surveys, they used a regression model to relate over 700 comparisons of achievement in classes of varying size.

The energy and innovation used by Glass and Smith to compile their statistical methodology are commendable, if not circumspect. In their obvious desire to compile a means of integrating diverse pieces of data, however, they committed a few glaring methodological errors.

A major flaw in the very basis of their system is the assumption that the size of their sample assures randomization. While, in some cases, large populations may be assumed to comprise random distributions, the sample used by Glass and Smith does not fall into this category. The limits of their sample were not determined solely by biology, the blind governor or random distributions. Instead, its boundaries were fixed by a variety of experiments and researchers, each concerned with the issue of class size. Also inherent in Glass and Smith's sampling is the uncertain influence of the time variable. If the authors mistakenly assume randomization in one time period, randomization in a sample drawn across several decades becomes almost impossible to establish. The interaction of motives

of the various experimenters with the time variable further weakens the supposed Glass-Smith randomization. The authors concede that each of four time periods was characterized by a different research emphasis. These intervening factors segment and combine to weaken the assumed normality of the general sample.

The flaws introduced by the Glass and Smith approach to randomization may be dwarfed by the role of statistical error in their effort. Because the new study contains a collection of samples rather than a single one, it also contains a collection of sampling and treatment errors. The authors concede that error and instability exist in the data, but confess they do not know how to deal with them.[3] By collecting a number of populations, Glass and Smith have constructed a larger analysis whose deviations from reality may be greater than that in each of its component parts.

Allied to the incidence of error is the role of statistical significance in the Glass-Smith approach. The authors ignore the presence or absence of significance in each of their component studies, observing that because their sample size is so large, such tests would be an 'empty pro forma ritual. A number of earlier studies, they point out, have taken "statistical significance"(their quotes) far too seriously.[4] This, of course, is hardly the case. Statistical significance is intimately connected with the dimensions of treatment populations. Generalization, even among populations with similar characteristics, is exceedingly difficult.

Randomization, error, and statistical significance are all methodological difficulties of the Glass-Smith approach. In their totality, however, these problems arise from the authors' pursuit of a direct relationship

between class size and achievement. This quest apparently led Glass and Smith to minimize the difficulties inherent in their methodology.

This pattern is most apparent in the authors' statistical effort to portray the curvilinear relationship between class size and achievement. Despite the fact that experiments involving similar conditions have produced different results regarding the impact of class size on achievement, they insist on portraying these outcomes as single points on a line. They make this admission while conceding that "the data base is laced with a complicated structure of interdependent observations" and that "..there is no sensible way to reduce each study to a single observation".[5] Glass and Smith claim that earlier studies lacked "sufficiently sophisticated" research techniques. Unfortunately, they may be as guilty as any of searching for a mythical direct relationship between variables.

Connected with the methodological problems inherent in the new research concerning class size are limits in the scope of the investigation. The authors note that no technique exists for systematically identifying properties of elements which might interact with the relationship between class size and achievement. Under these circumstances, they argue that "One simply reads a few studies from the literature of interest, talks with experts, and then makes a best guess;..."[6] In this case, the best guesses of the authors consisted of five general categories: study identification, instruction, classroom demographics, study conditions, and outcome variable.

The technique used by Glass and Smith to identify the scope of possible mediating variables is reasonable, if not comprehensive. The authors correctly realized that they would be unable to construct intervening factors themselves, but they may have done more guessing than searching.

The range of possible intervening variables which they produced is woefully inadequate. Over half the factors identified are such quantitative aspects of instruction as the number of pupils, the number of instructional groups, the duration of instruction, and the pupil/teacher ratio. Classroom demographics includes but two variables: pupil ability and age of participating students.

The authors' limitation of the scope of possible demographic influences seriously limits the worth of their study. Without randomization assured, the socio-economic level of students, for example, might have influenced the results obtained. It has been demonstrated that children of high socio-economic level frequently attend smaller classes and exhibit higher achievement than those of low socio-economic level. Thus, by insuring greater educational opportunity and making smaller classes possible, socio-economic level might produce the same relationship between class size and achievement delineated by this research. Teacher salaries might also have influenced the results obtained. Within constant expenditure totals, districts which maintain high instructional salary levels and employ relatively few teachers, while those with lower salaries, have larger staffs. Because teacher salaries, in this case, correlate with class size, they might also exert an influence on achievement.

It should be emphasized that neither socio-economic level nor instructional compensation is a curious or unusual variable whose influence might be peripheral. These are significant patterns whose impact has been examined by the courts as well as by educational researchers. Yet Glass and Smith have made little effort to investigate their impact.

It may be presumptuous to assume, but it seems that the concern of Glass and Smith for the possible role of internal, instructional factors,

have resulted in a neglect of the impact of more general concerns. It might be expected in a pioneer effort to integrate and apply innovate techniques of analysis. In their focus on developing a methodology, the authors apparently overlooked some of the environment in which the methodology must function. Qualifications such as these can excuse, but not correct, errors of omission. The limited number of variables examined by Glass and Smith combine with the weaknesses of their methodology to limit seriously the generalizability of their study.

Beyond these considerations, any attempt to evaluate the work of Glass and Smith must consider the implications of their research. Especially significant are the financial and historical inferences which proceed from the study.

As has already been noted, monetary factors do not play a major role in the research design of Glass and Smith. A review of the implications of the study demonstrates how small this role really is. The authors boldly conclude that a direct relationship exists between class size and achievement, and that the achievement curve begins to rise rapidly only when class size reaches 15 students. Even if one assumes the methodology of study to be valid, however, financial constraints make the teaching of classes with 15 students difficult at best. Given the current state of educational finance, it is often a challenge to budget for classes of 20-25 students.[7] If the authors' advice is followed one step further, and classes are reduced to between 1 and 19 students, the levels of funding required increases geometrically.

William Smith has suggested one way of getting around these difficulties, recommending weekly small group sessions to provide some instruction at

low pupil/teacher ratios.[8] To do this, however, would introduce additional intervening variables such as the length of time between small classes, and the interactive effect of small and large classes within the same subject. The influences of these and other factors have not been investigated within the Glass-Smith analysis.

The new study's lack of congruence with assumptions of educational finance, as well as other aspects of the work, effectively delineate the historical implications of the authors' efforts. By analyzing the relationship between achievement and class sizes smaller than 20, Glass and Stanley have broken with the frame of reference used in most studies of this type. Yet, in examining the effects of classes with fewer than 10 students, they may have been wasting effort. Do we really need a massive study to prove that instruction in classes of 1-5 is more effective than in classes of 25-30? Perhaps the real issue surrounds the definition of a class. Historically, groups as small as those which produced the greatest achievement in this latest study have been considered 'classes' only in the most general sense of the word.[9]

Through fundamentally changing the definition of one of their variables, as well as through questionable methodologies, Glass and Smith have thus produced a rather shaky set of conclusions. The bases and techniques of their approach drastically limit the value of its results.

From a general perspective, all of these factors serve to place the work of Glass and Smith within its proper historical context. The authors claim that their work is innovative, a break with statistical and other conventions. Yet the study's approach requires substantial refinement. Its fabric seems laced with a desire to produce a concrete relationship

between the two variables, and with a bias toward instructional tutoring. The necessity to establish casual relationships permeates the study. The authors regret that previous efforts to establish such connections have dissolved into 'cynical despair'. At the same time, their emphasis on individual instruction shapes the very framework of the analysis. Early in their report of findings, Glass and Smith delineate four different periods in the development of research on this topic, the last of which, "the individualization era", stretches from 1970 to the present.[10] Perhaps ironically, the authors have produced a historical analysis so insightful that their own effort fits into the last of its phases.

Reference Notes

1. Gene V. Glass and Mary Lee Smith, Meta-Analysis of Research on the Relationship of Class-Size and Achievement (San Francisco: Far West Laboratory for Educational Research and Development, 1978):v.

2. Ibid., 19.

3. Ibid., 20.

4. Ibid., 2, 19.

5. Ibid., 19.

6. Ibid., 10.

7. Glen I. Earthman, Study of Space Utilization (Philadelphia: Philadelphia, Pennsylvania School District, 1969); Ian Templeton, "Class Size", Educational Management Review Series 8 (August 1972); John Heim and Lewis Perl, The Educational Production Function: Implicaitons for Educational Manpower Policy. (New York: Institute for Public Employment, 1974): 25-8.

8. "Glass Links Small Class Size to Increased Student Achievement", Phi Delta Kappan (February 1979):411.

9. Howard K. Holland and Armand J. Galfo, An Analysis of Research Concerning Class Size. Research Contribution to Educational Planning, No. 11. (Richmond, Va.: State Department of Educational Research, 1964); Howard M. Coble, "Some New Insights on Class Size and Differences in Teacher/Pupil Performance in the Various Subjects", Exchange 28 (September 1968):1-13; Holly Smith, "Class Size--Does it Make a Difference?" (Urban, Ill.: National Council of Teachers of English, 1971); Dwight H. Lindbloom, Class Size as it Effects Educational Procedures and Institutional Outcomes. (Minneapolis: Educational Research and Development Council, 1970).

10. Glass and Smith, Meta-Analysis of Research on the Relationship of Class Size and Achievement,1.